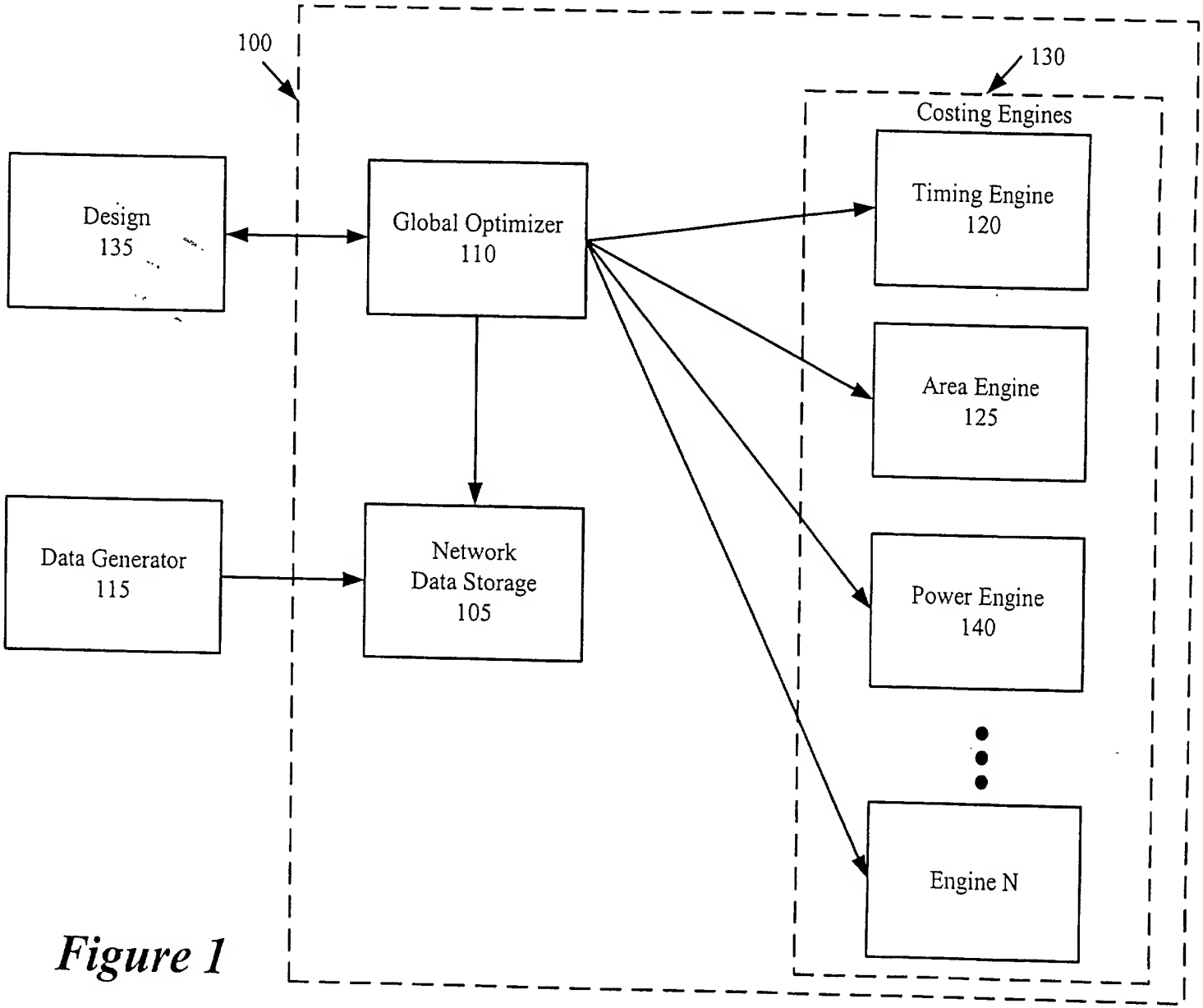

100
130
Costing Engines
Design
135
Global Optimizer
110
Timing Engine
120
Area Engine
125
Power Engine
140
Engine N
Data Generator
115
Network
Data Storage
105

Figure 1

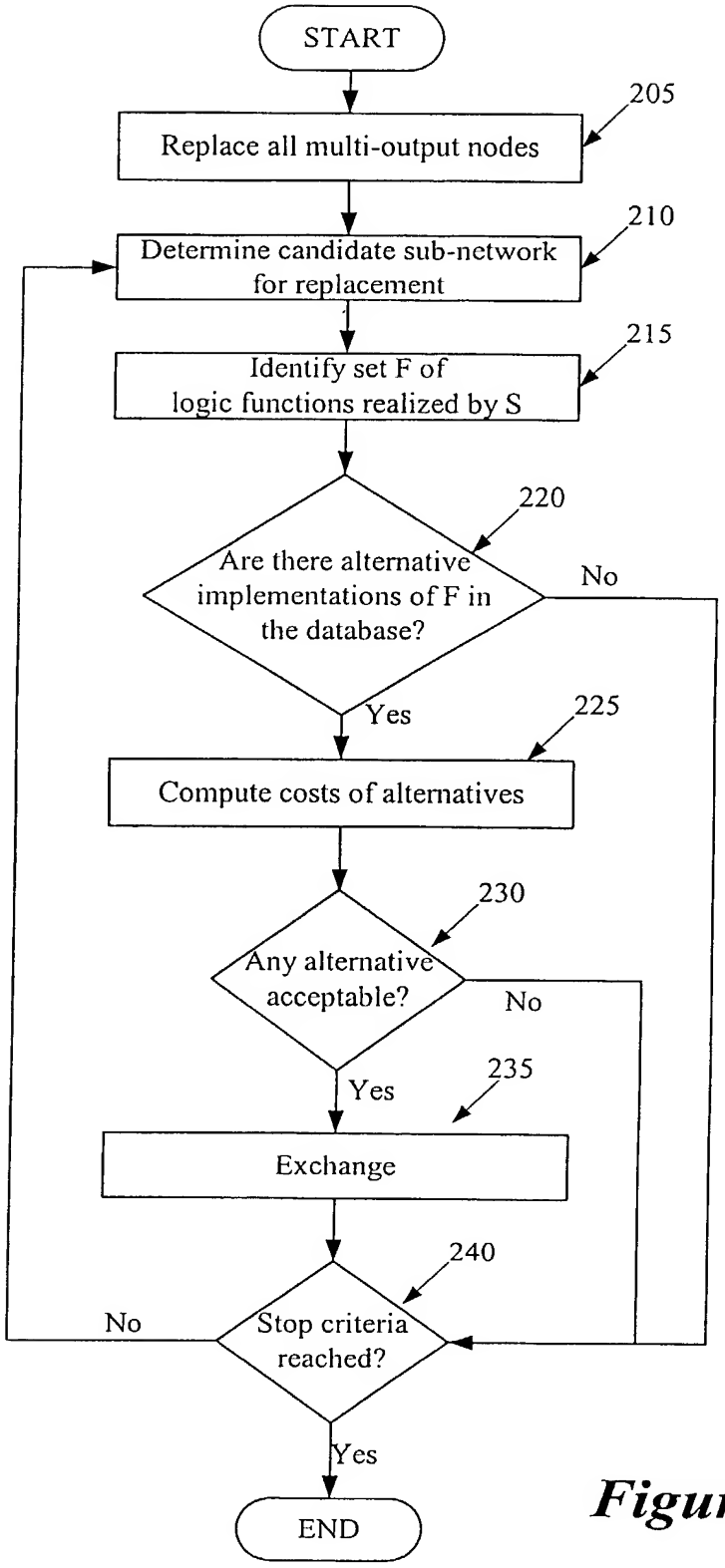

START
205
200
Replace all multi-output nodes
210
Determine candidate sub-network for replacement
215
Identify set F of logic functions realized by S
220
Are there alternative implementations of F in the database?
No
Yes
225
Compute costs of alternatives
230
Any alternative acceptable?
No
Yes
235
Exchange
240
Stop criteria reached?
No
Yes
END

Figure 2

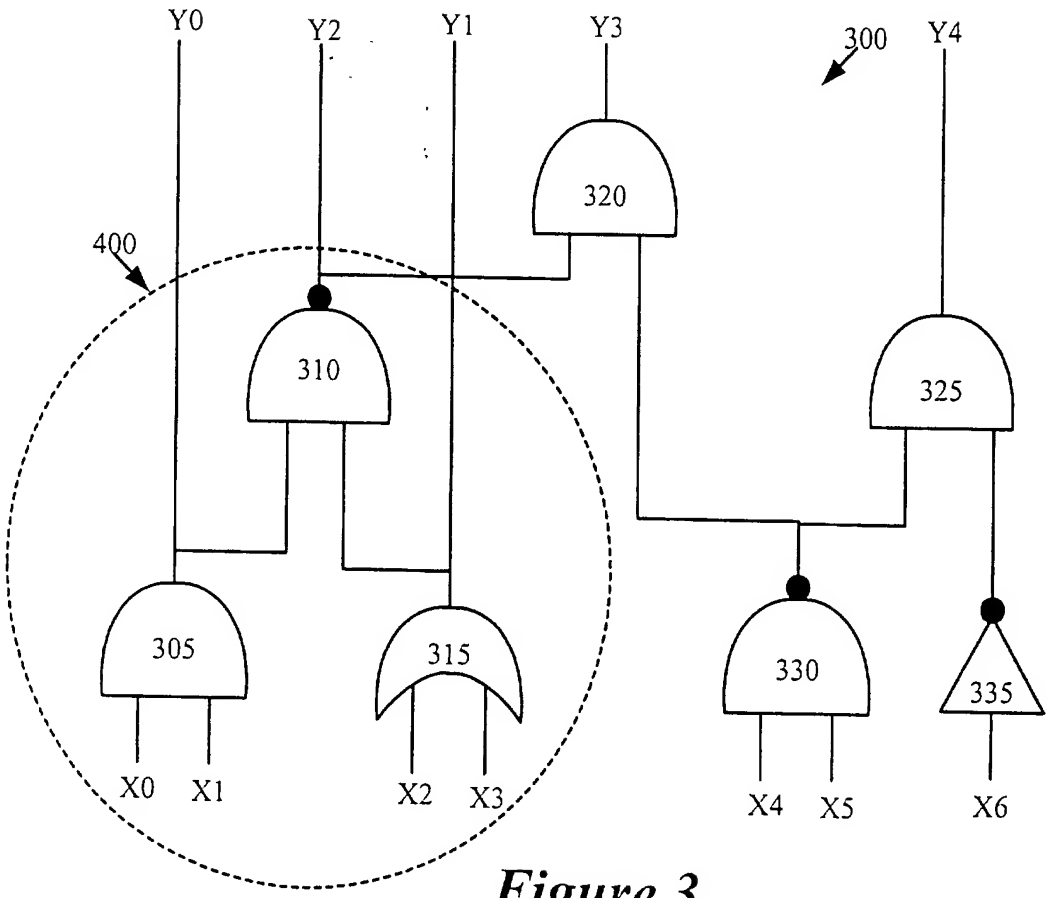


Figure 3

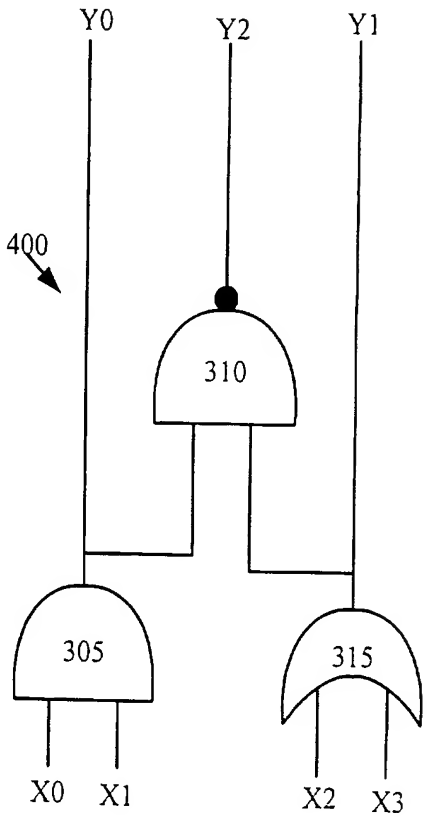


Figure4

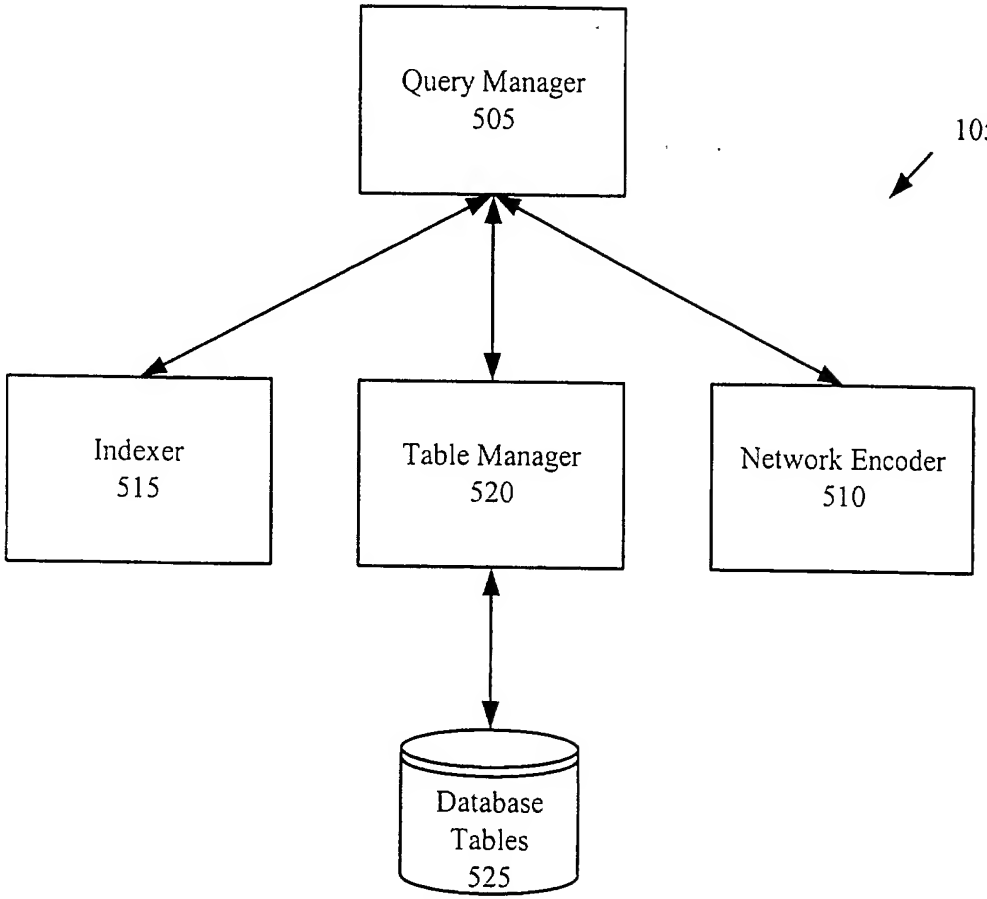

Query Manager
505
105
Indexer
515
Table Manager
520
Network Encoder
510
Database
Tables
525

Figure 5

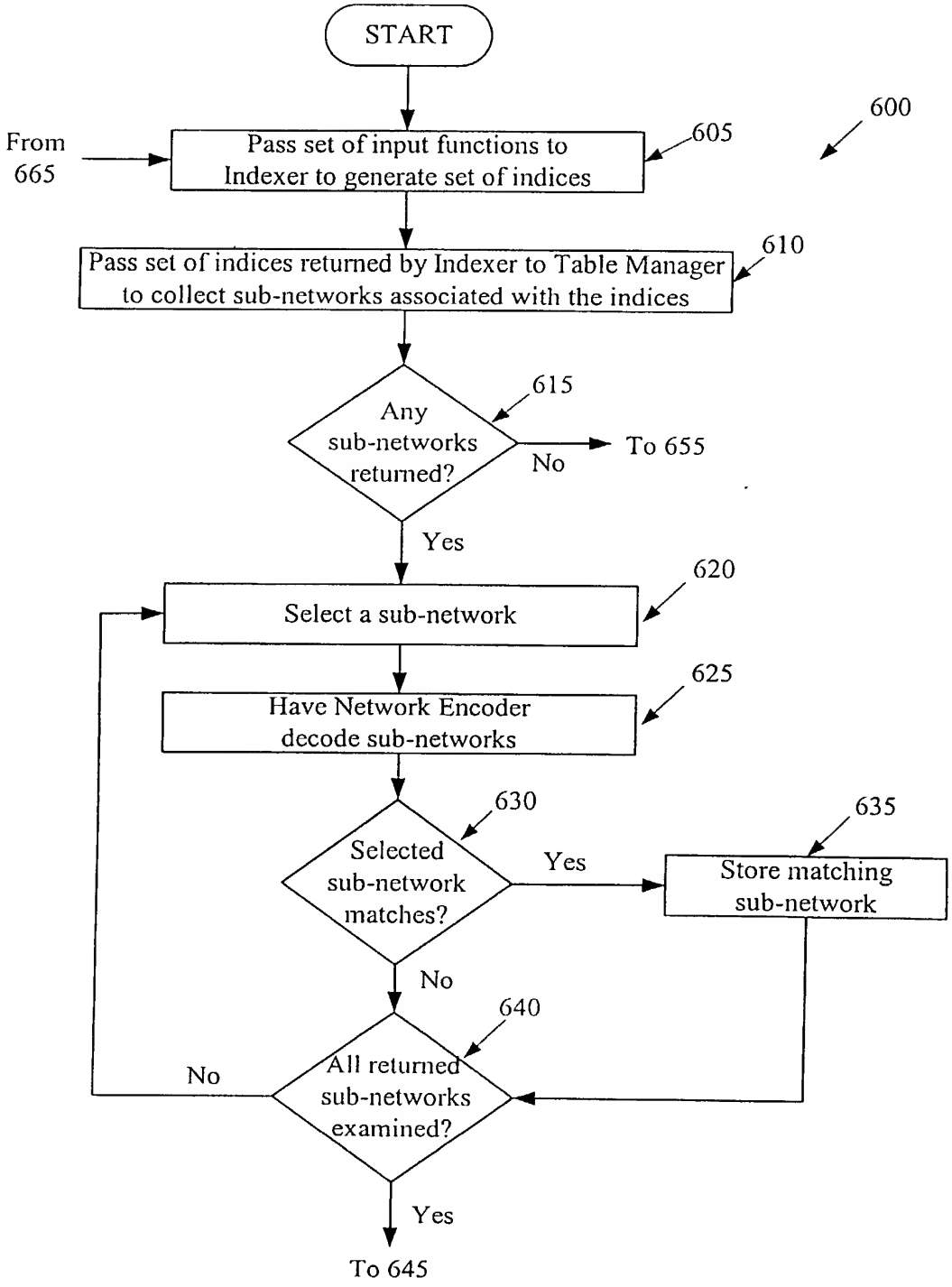


Figure 6A

Figure 6: Figure 6A / Figure 6B

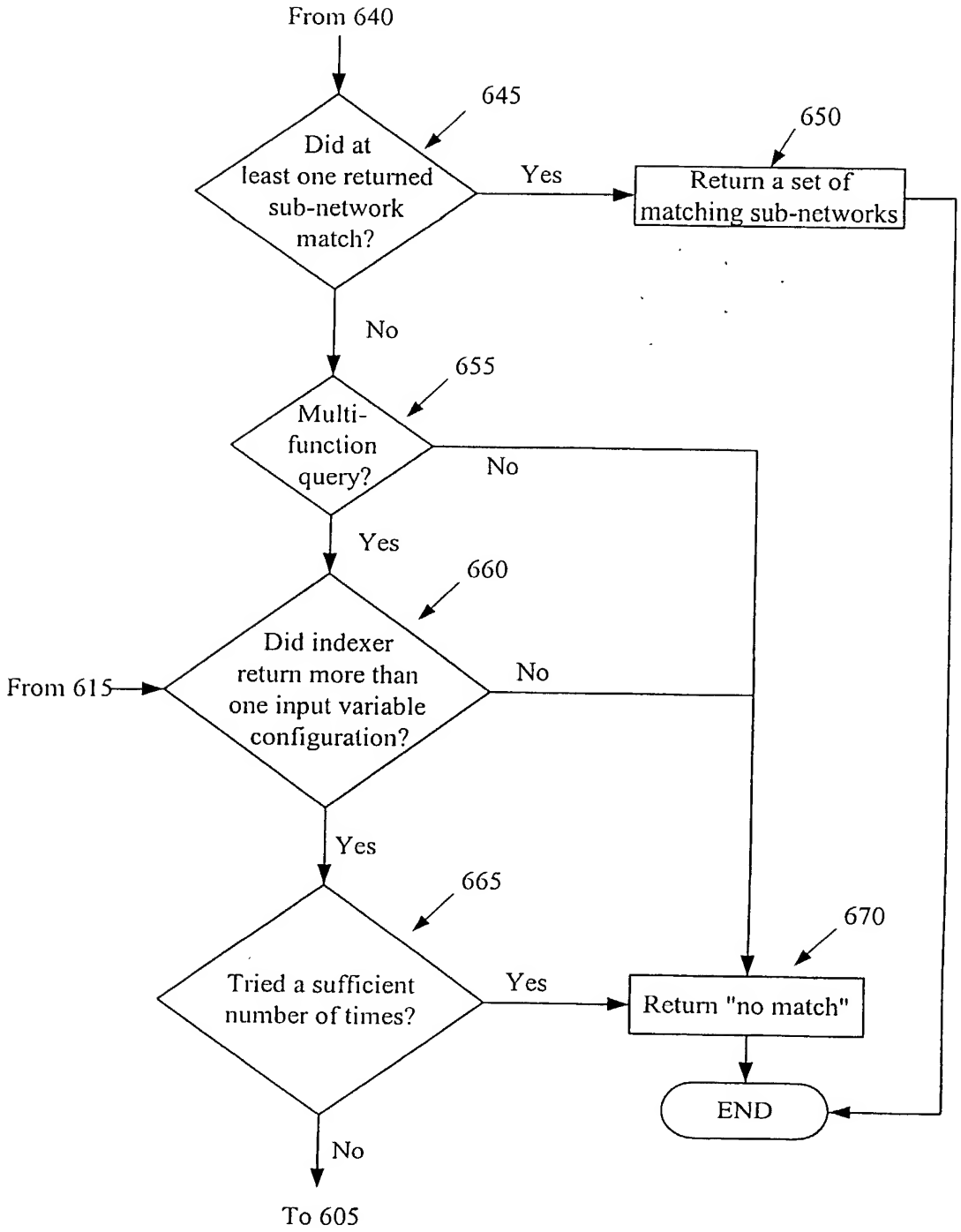

From 640
645
Did at least one returned sub-network match?
Yes
650
Return a set of matching sub-networks
No
655
Multi-function query?
No
Yes
660
Did indexer return more than one input variable configuration?
From 615
No
Yes
665
Tried a sufficient number of times?
Yes
670
Return "no match"
END
No
To 605

Figure 6B

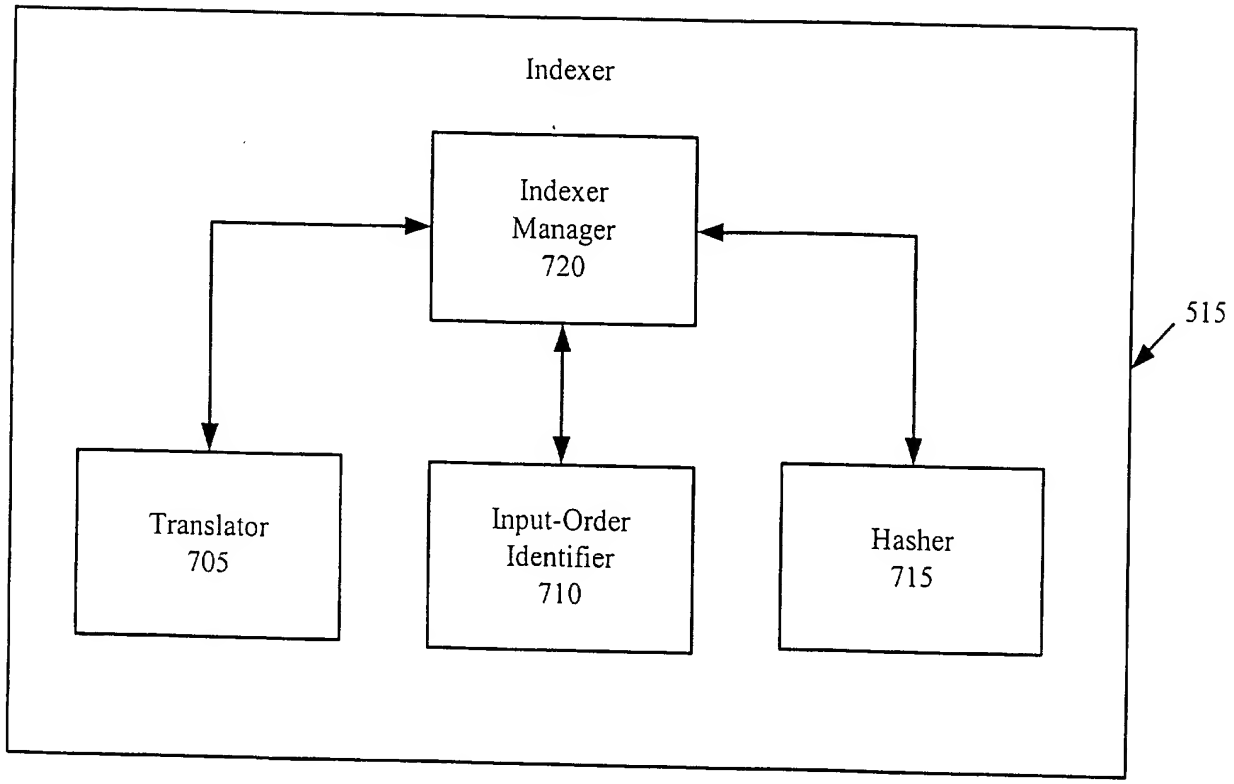

Indexer
Indexer Manager 720
515
Translator 705
Input-Order Identifier 710
Hasher 715

Figure 7

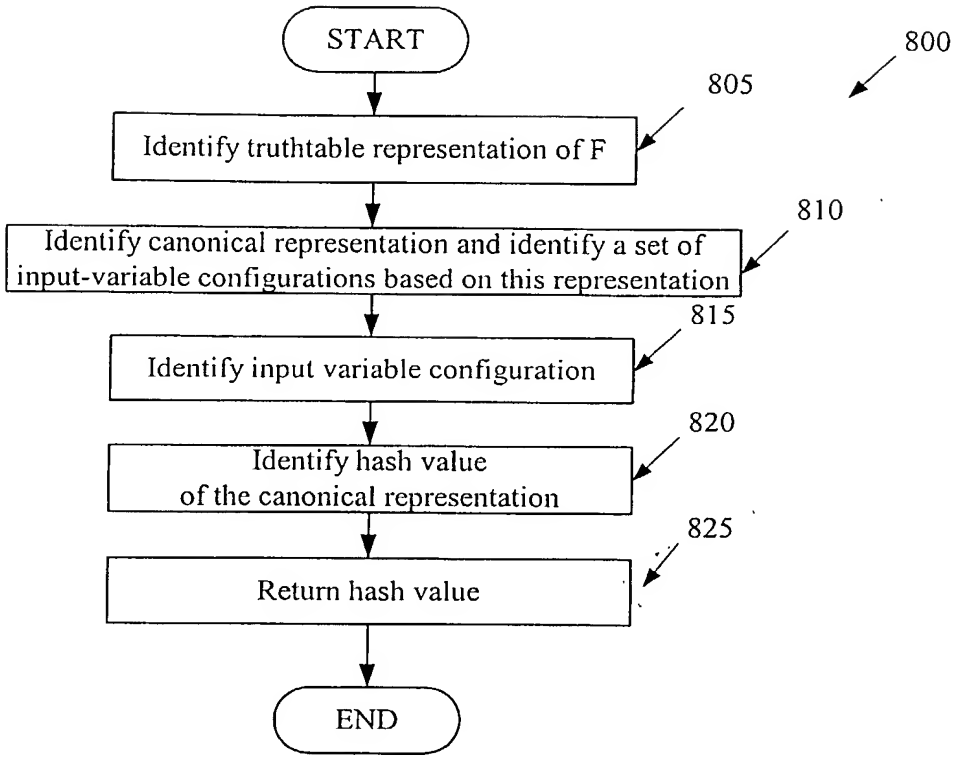


Figure 8

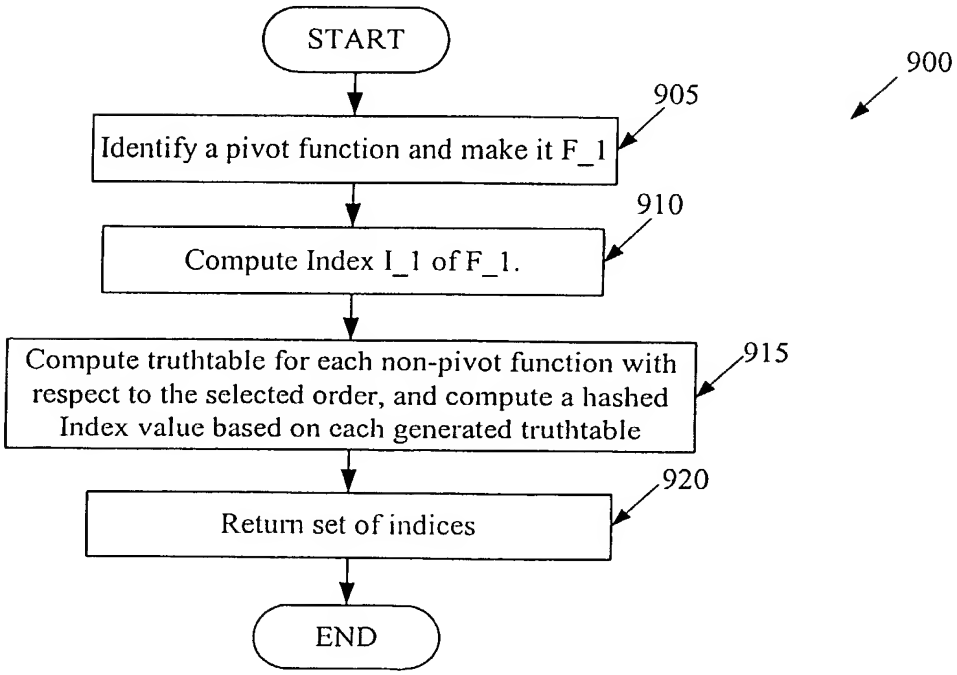
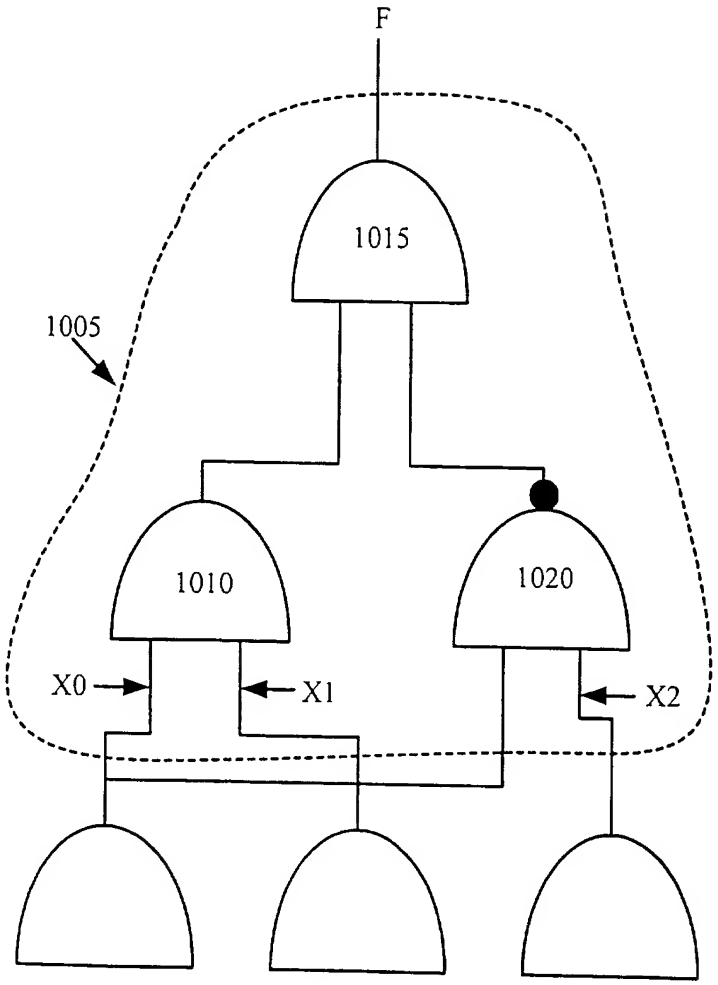
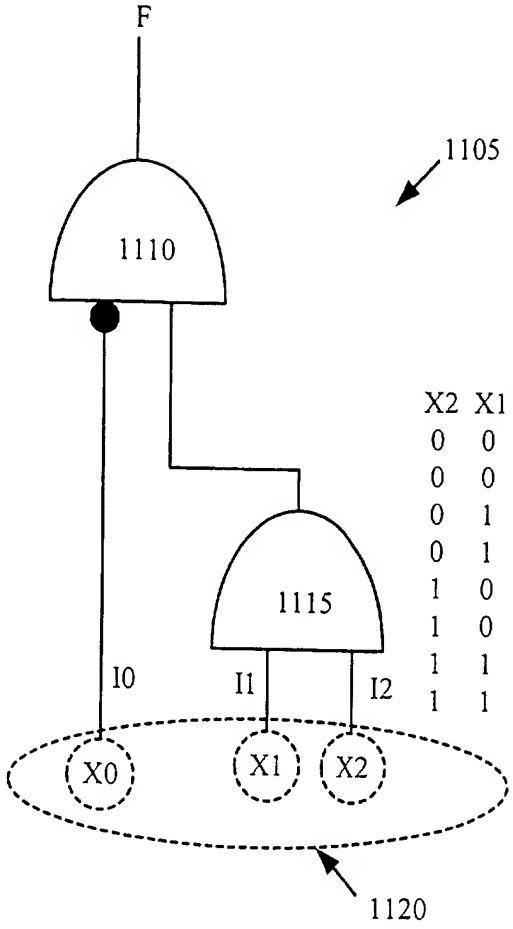


Figure 9



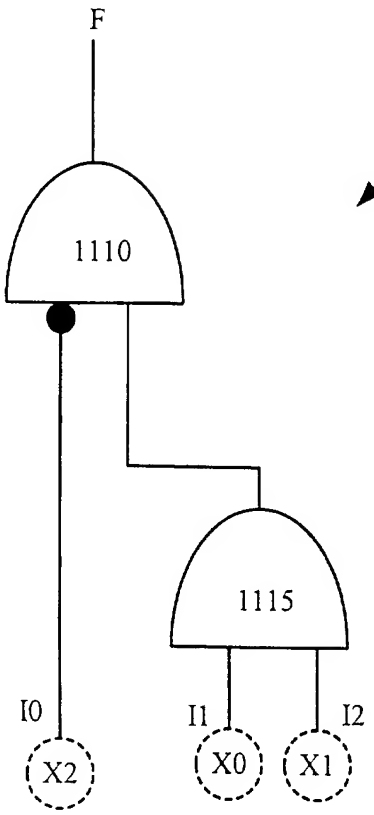
X2	X1	X0	TT
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	0

Figure 10



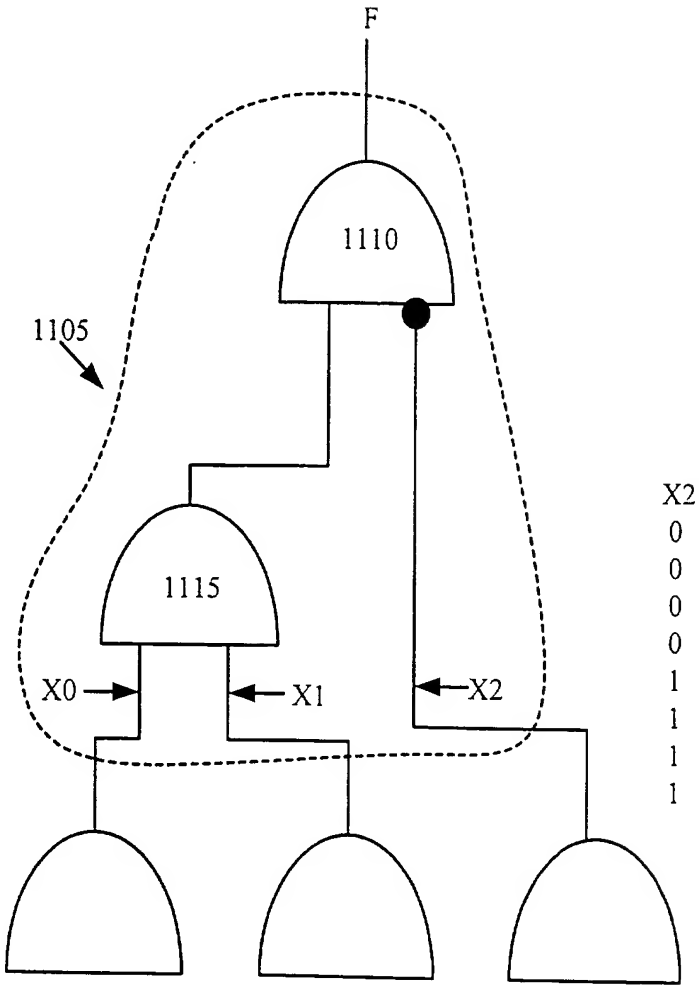
X2	X1	X0	TT
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	1
1	1	1	0

Figure 11



X2	X1	X0	TT
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	0

Figure 12



X2	X1	X0	TT
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	0

Figure 13

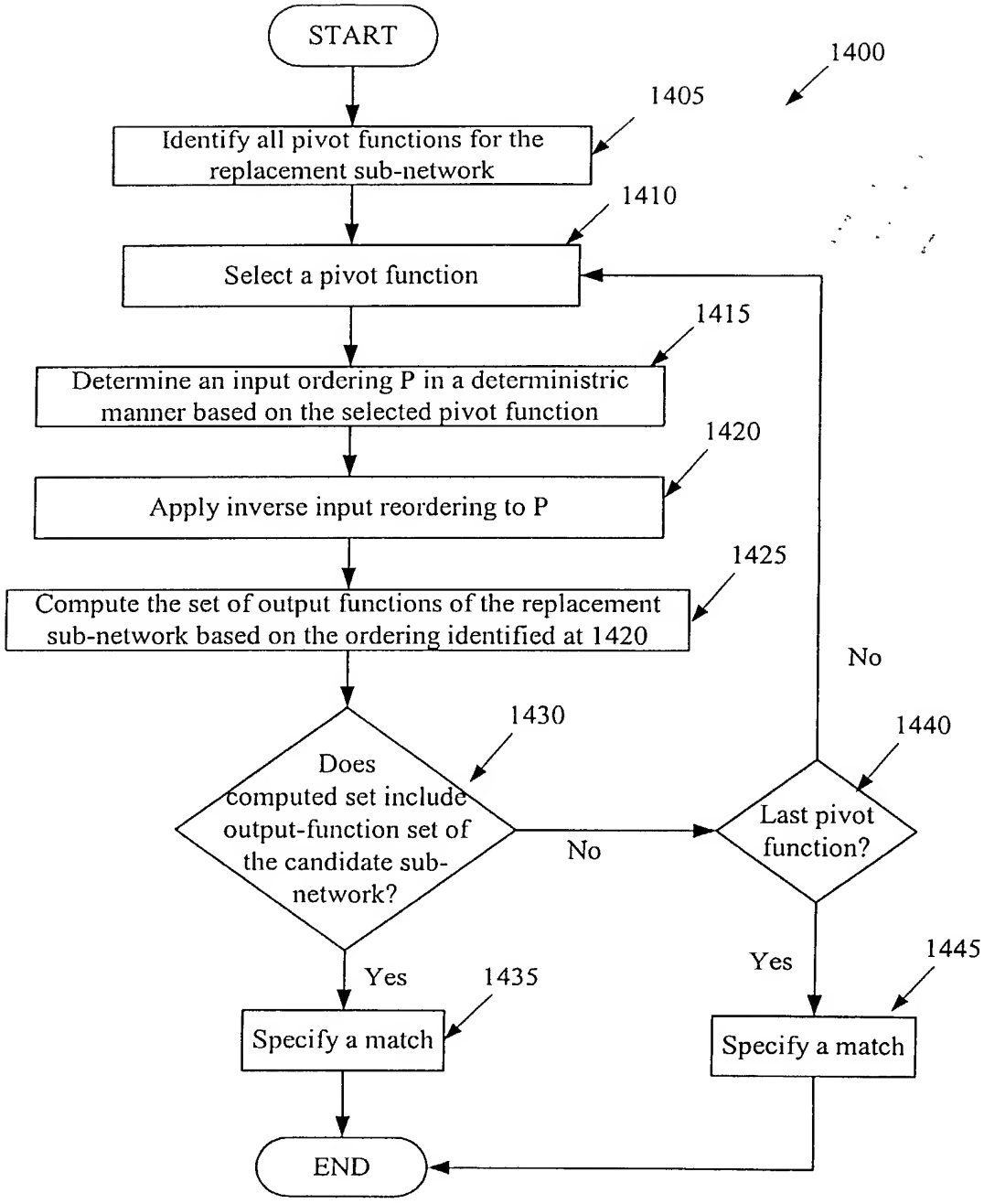

START
1400
1405
Identify all pivot functions for the replacement sub-network
1410
Select a pivot function
1415
Determine an input ordering P in a deterministic manner based on the selected pivot function
1420
Apply inverse input reordering to P
1425
Compute the set of output functions of the replacement sub-network based on the ordering identified at 1420
1430
Does computed set include output-function set of the candidate sub-network?
No
1440
Last pivot function?
No
Yes
1435
Specify a match
Yes
1445
Specify a match
END

Figure 14

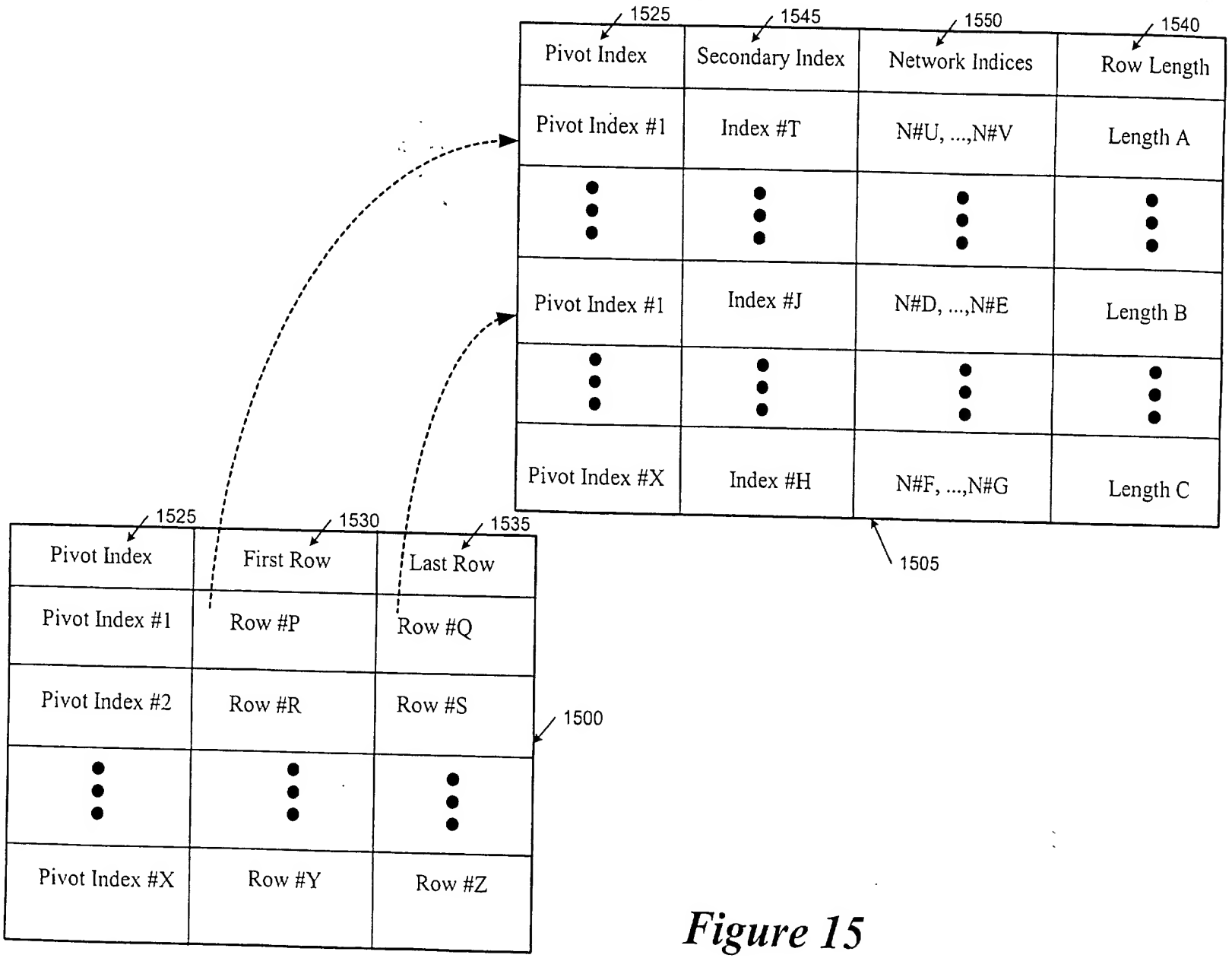

1525
1545
1550
1540
Pivot Index
Secondary Index
Network Indices
Row Length
Pivot Index #1
Index #T
N#U, ...,N#V
Length A
Pivot Index #1
Index #J
N#D, ...,N#E
Length B
Pivot Index #X
Index #H
N#F, ...,N#G
Length C
1505
1525
1530
1535
Pivot Index
First Row
Last Row
Pivot Index #1
Row #P
Row #Q
Pivot Index #2
Row #R
Row #S
Pivot Index #X
Row #Y
Row #Z
1500

Figure 15

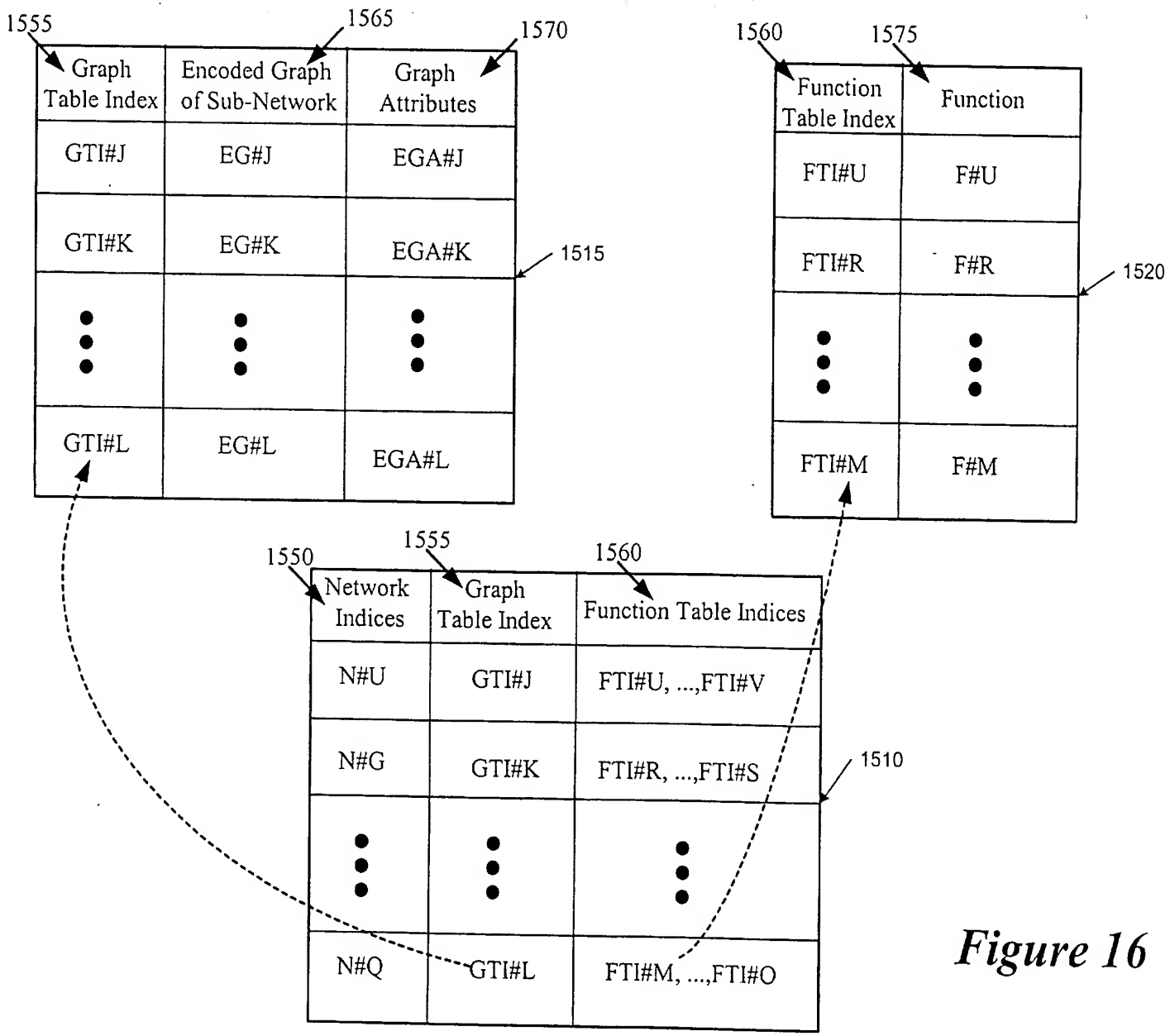

1555
1565
1570
Graph Table Index
Encoded Graph of Sub-Network
Graph Attributes
GTI#J
EG#J
EGA#J
GTI#K
EG#K
EGA#K
1515
GTI#L
EG#L
EGA#L
1560
1575
Function Table Index
Function
FTI#U
F#U
FTI#R
F#R
1520
FTI#M
F#M
1550
1555
1560
Network Indices
Graph Table Index
Function Table Indices
N#U
GTI#J
FTI#U, ...,FTI#V
N#G
GTI#K
FTI#R, ...,FTI#S
1510
N#Q
GTI#L
FTI#M, ...,FTI#O

Figure 16

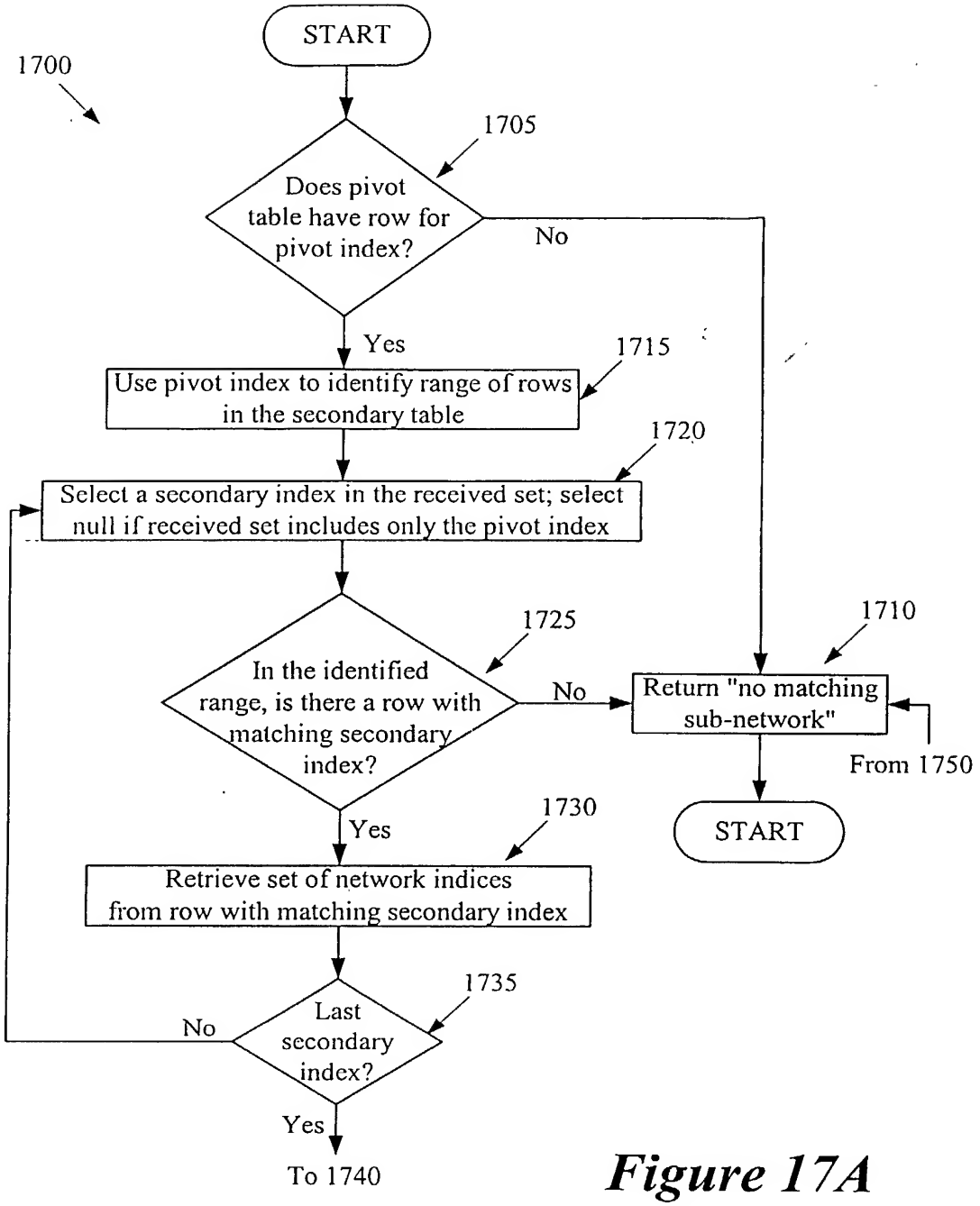


Figure 17A

Figure 17: *Figure 17A* / *Figure 17B*

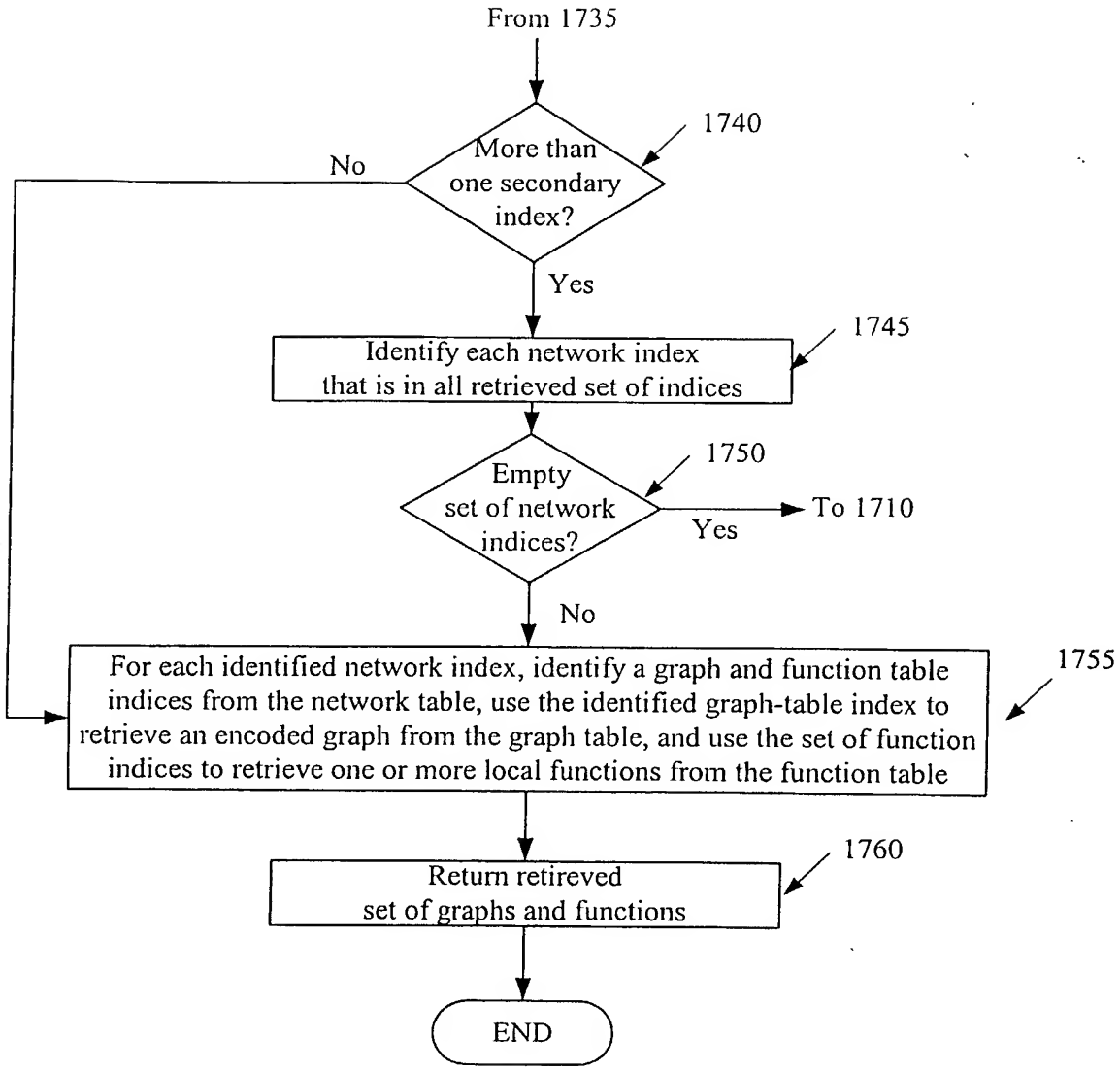

From 1735
More than one secondary index?
1740
No
Yes
Identify each network index that is in all retrieved set of indices
1745
Empty set of network indices?
1750
To 1710
Yes
No
For each identified network index, identify a graph and function table indices from the network table, use the identified graph-table index to retrieve an encoded graph from the graph table, and use the set of function indices to retrieve one or more local functions from the function table
1755
Return retireved set of graphs and functions
1760
END

Figure 17B

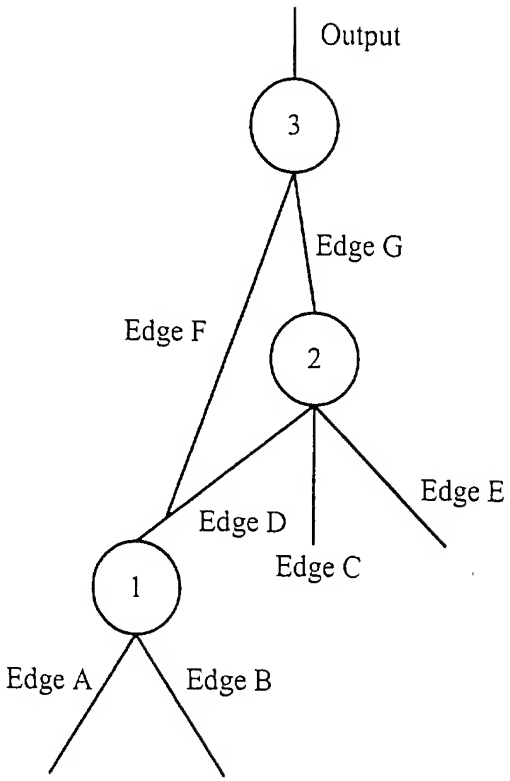


Figure 18

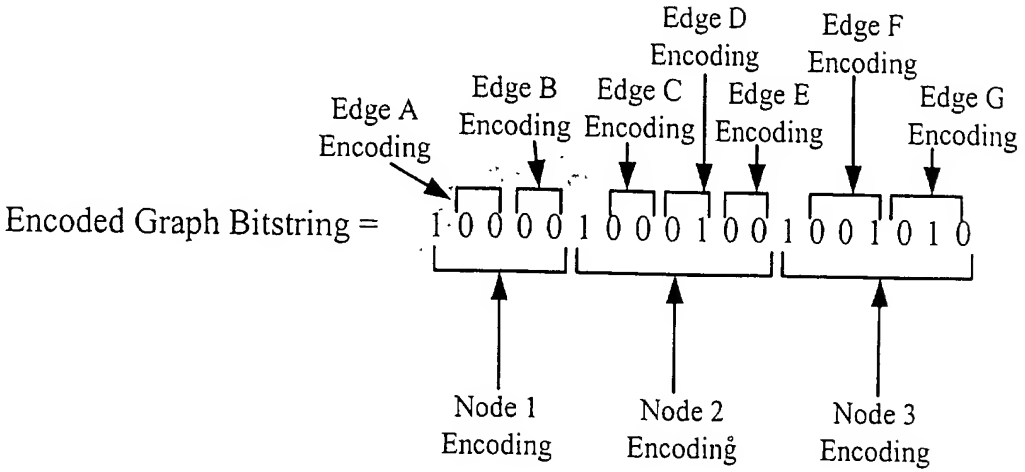


Figure 19

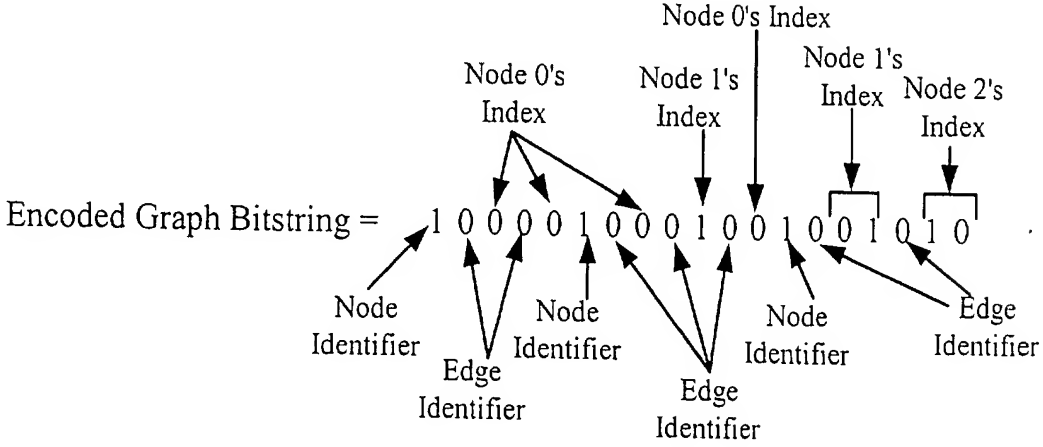


Figure 20

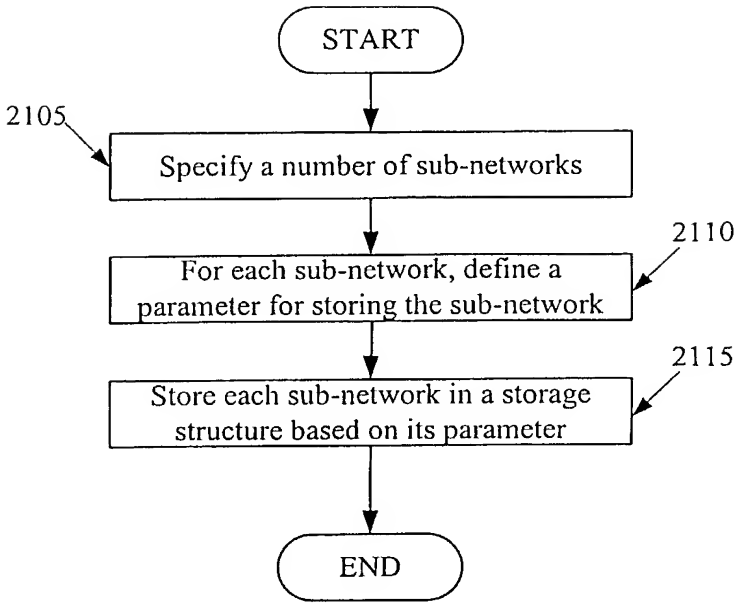


Figure 21

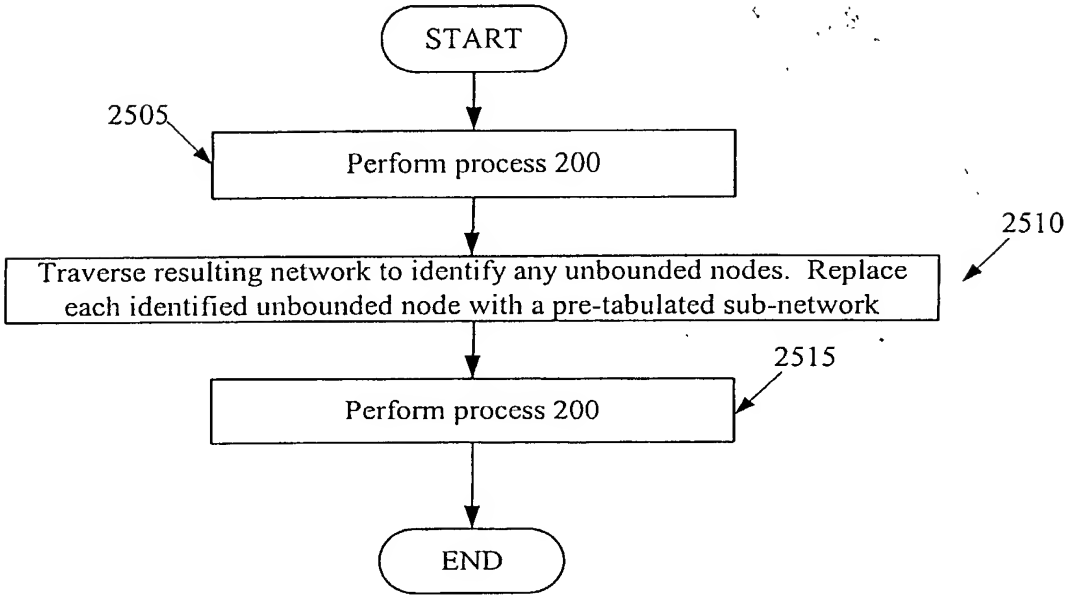


Figure 25

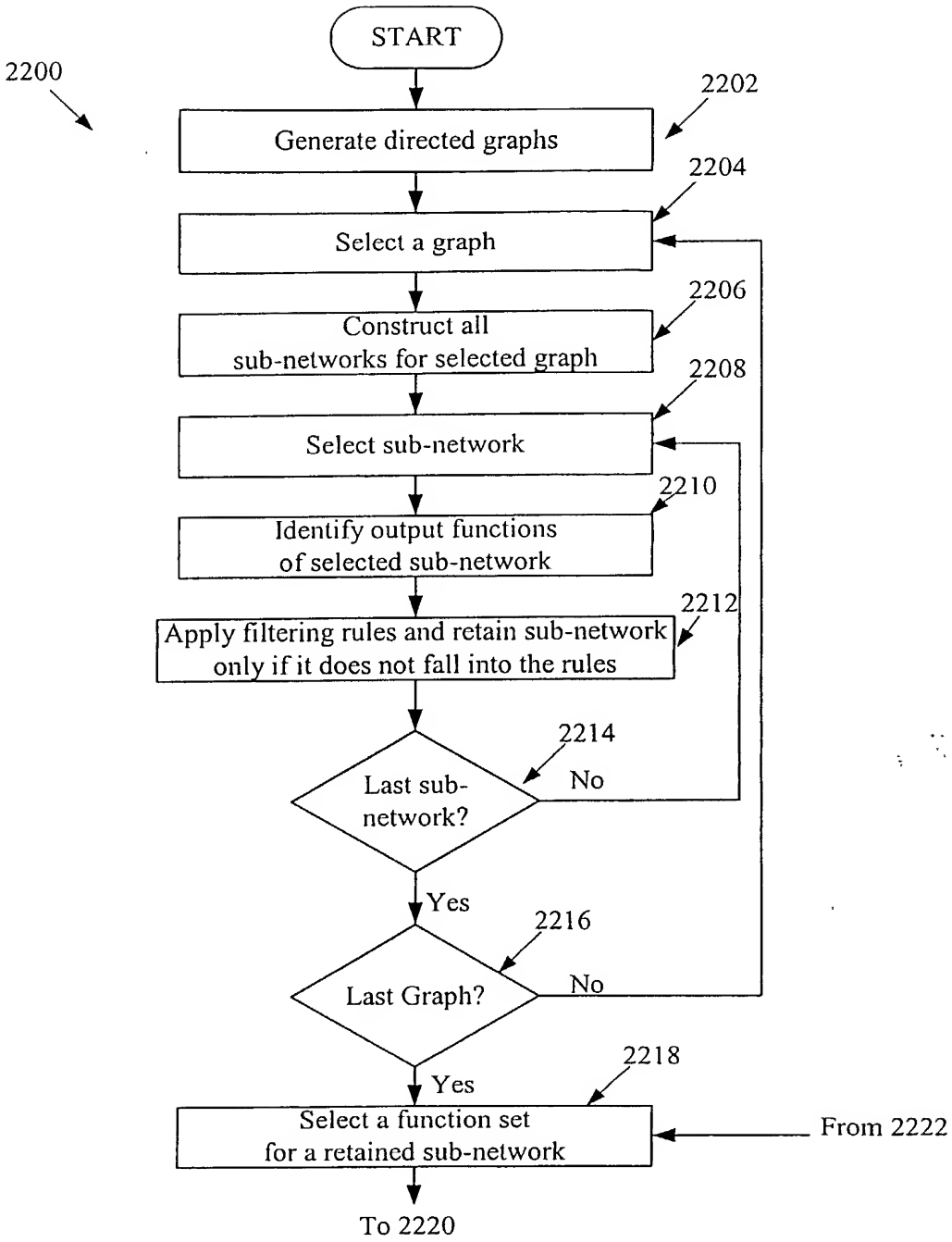


Figure 22A

Figure 22: ***Figure 22A*** / ***Figure 22B*** / ***Figure 22C***

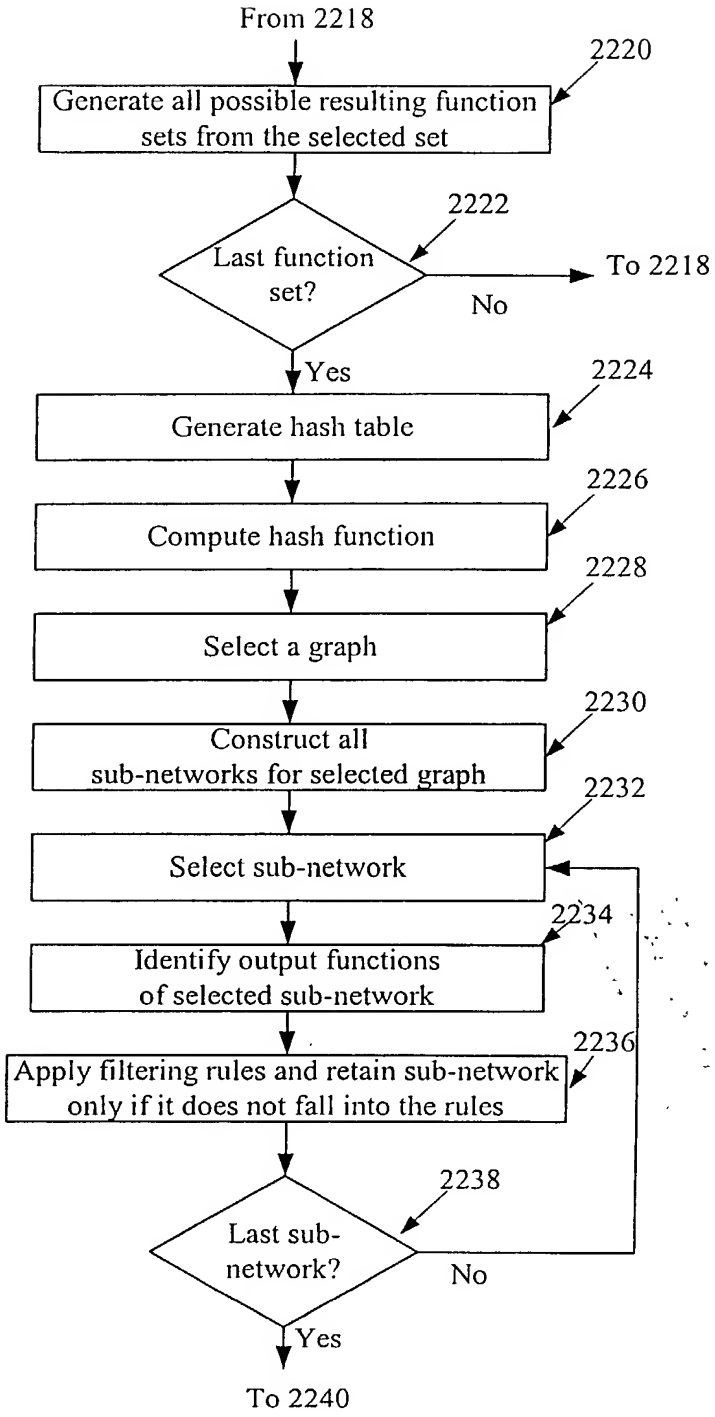

From 2218
2220
Generate all possible resulting function sets from the selected set
2222
Last function set?
To 2218
No
Yes
2224
Generate hash table
2226
Compute hash function
2228
Select a graph
2230
Construct all sub-networks for selected graph
2232
Select sub-network
2234
Identify output functions of selected sub-network
2236
Apply filtering rules and retain sub-network only if it does not fall into the rules
2238
Last sub-network?
No
Yes
To 2240

Figure 22B

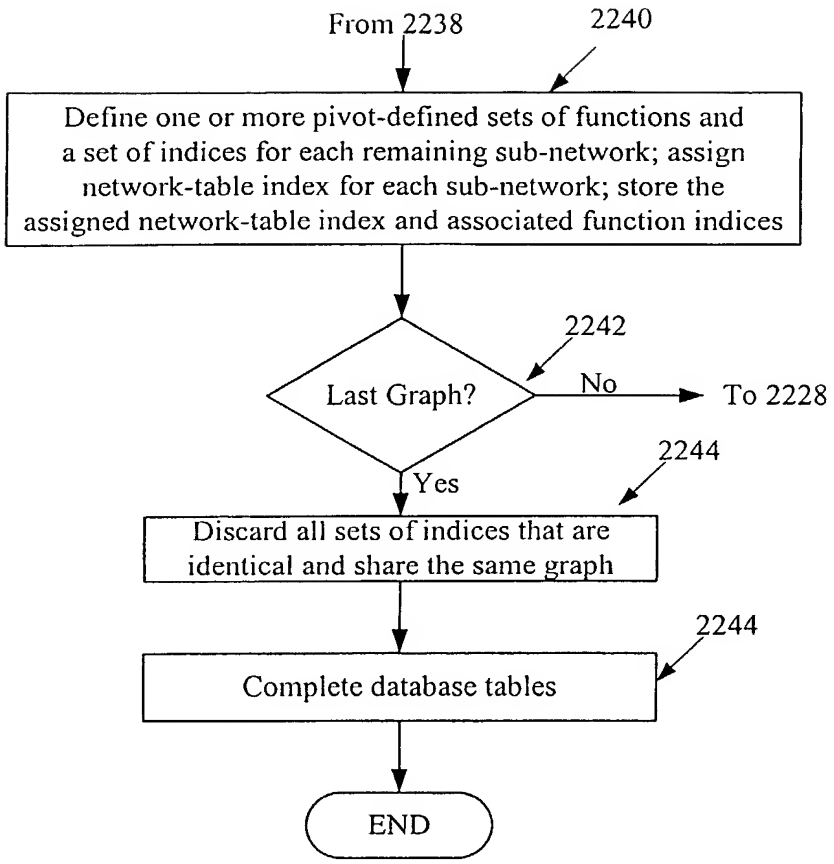

From 2238
2240
Define one or more pivot-defined sets of functions and a set of indices for each remaining sub-network; assign network-table index for each sub-network; store the assigned network-table index and associated function indices
2242
Last Graph?
No
To 2228
Yes
2244
Discard all sets of indices that are identical and share the same graph
2244
Complete database tables
END

Figure 22C

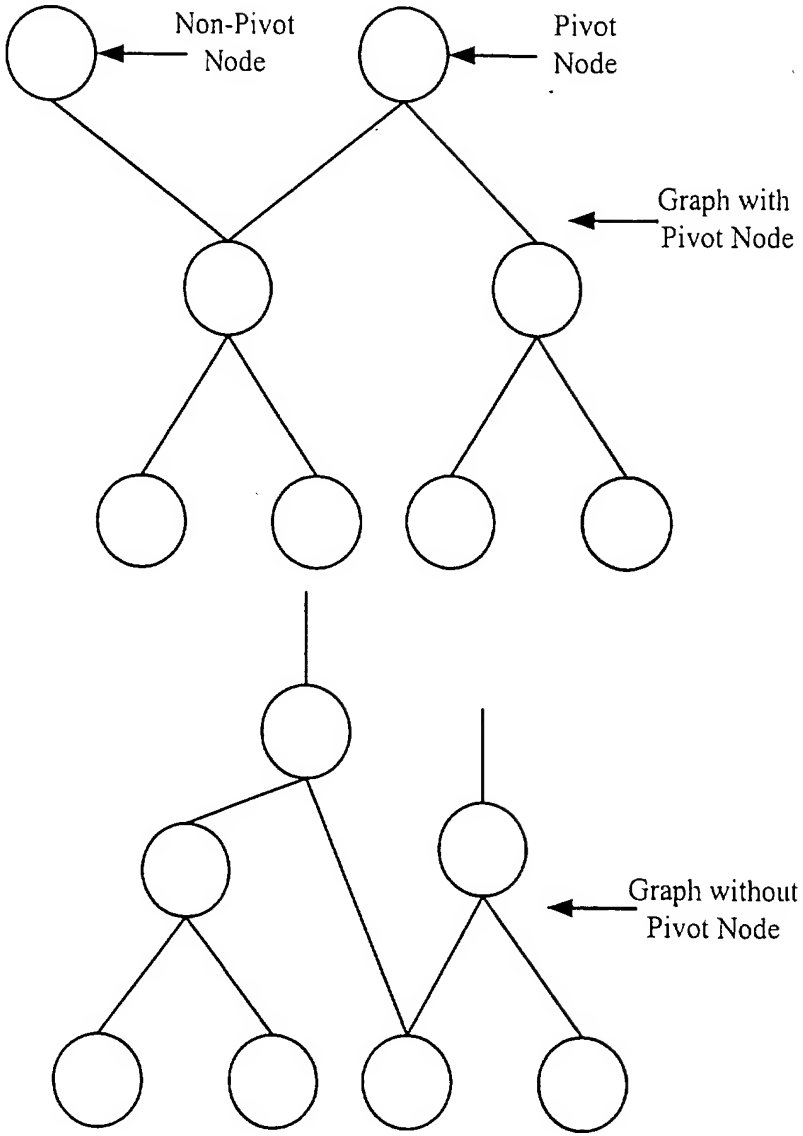


Figure 23

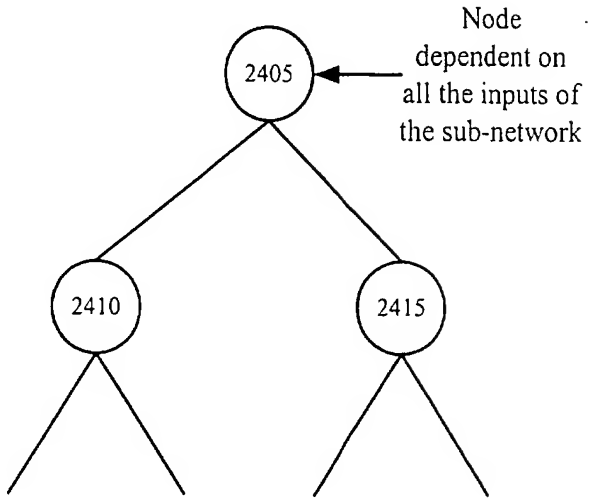


Figure 24

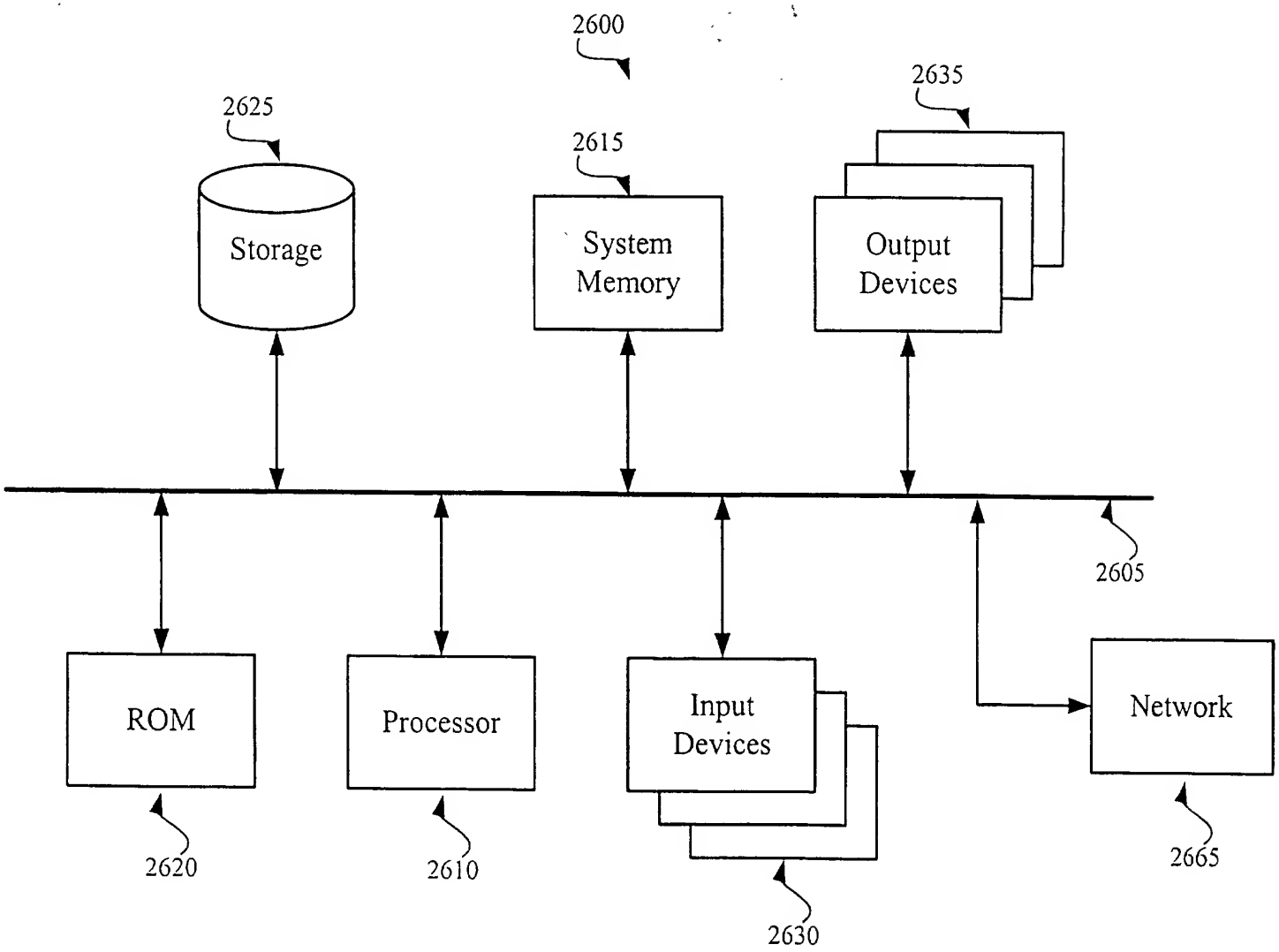

2600
2625
2615
2635
Storage
System Memory
Output Devices
2605
ROM
Processor
Input Devices
Network
2620
2610
2630
2665

Figure 26